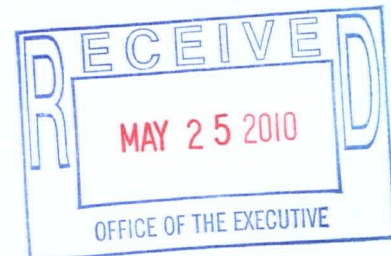




505 W. Northern Lights Blvd, Suite 205  
Anchorage, AK 99503  
(907) 222-7714  
www.akaction.org  
info@akaction.net

Dennis J. McLerran, Regional Administrator  
Office of Environmental Cleanup  
US Environmental Protection Agency, Region 10  
1200 Sixth Avenue  
Seattle, WA 98101



May 21, 2010

Dear Mr. McLerran,

*Under the authority of CERCLA Section 105 (d), as amended, the petitioner,*

Name: Alaska Community Action on Toxics (ACAT)  
Address: 505 W. Northern Lights Blvd, Suite 205, Anchorage, AK 99503  
Telephone Number): (907) 222-7714

*Alaska Community Action on Toxics hereby requests that U.S. EPA Region 10 conduct a preliminary assessment of the release of a hazardous substance, pollutant, or contaminant at the following location:*

Flint Hills Resources' North Pole Refinery, 1150 H and H Lane  
North Pole, AK 99705-7879

*Petitioner is affected by the release because:*

ACAT is a statewide non-profit organization whose mission is to assure justice by advocating for environmental and community health. We believe that everyone has a right to clean air, clean water and toxic-free food. ACAT has members in the North Pole area who may have contaminated wells. North Pole residents have contacted ACAT with concerns about the effects of sulfolane on drinking water sources and public health.

*Type or characteristics of the substance(s) involved:*

Sulfolane is a colorless, highly polar compound which is used in the crude oil refining process and is soluble in water, allowing it to be dissolved in and be carried along in groundwater.<sup>i</sup> It produces central nervous system stimulation or depression at acute concentrations in mammals. Inhalation of sulfolane at acute concentrations results in convulsions, vomiting, leukopenia, and death in exposed guinea pigs, squirrel monkeys and dogs. At lower concentrations, shrinkage of white pulp in the spleen occurs. Rats exposed

USEPA SF



1446339

to sulfolane in contaminated drinking water experienced neuropathy. Female rats exposed to sulfolane-contaminated drinking water experienced a decreased white blood cell count.

Three studies of the subchronic and chronic effects of sulfolane were reviewed in the Water Quality Guidelines for Sulfolane document produced by the British Columbia Ministry of Water, Land, and Air Protection<sup>ii</sup>:

**Andersen et al. (1977)**

Andersen *et al.* (1977) conducted subchronic (90 day) inhalation toxicity studies with rats, guinea pigs, beagle dogs, and squirrel monkeys. Animals were routinely evaluated for signs of potential toxic effects, such as alterations in physical appearance, locomotor activity, breathing patterns, appetite, or behaviour. Animals were also weighed and bled for hematological testing after 30 and 60 exposure-days, and at the end of the study. Blood, major organs, and tissues were also collected from each animal at the end of the study. Urinalysis examined pH, protein, sugar, ketone bodies, and occult blood at 24 hour intervals collected from the rats and guinea pigs. Six subchronic exposure studies were conducted: one study involved repeated exposure to 495 mg m<sup>-3</sup> for 8 hr day<sup>-1</sup>, 5 days week<sup>-1</sup> for 27 exposure days, and five studies looked at 23 hr day<sup>-1</sup>, continuous exposures of approximately 90 day duration to 200, 159, 20, 4.0, and 2.8 mg m<sup>-3</sup>.

Inhalation of atmospheres containing high concentrations (3,600 and 4,700 mg m<sup>-3</sup>) of aerosolized sulfolane resulted in leukopenia and convulsions within 24 hours. Concentrations of 200 and 495 mg sulfolane m<sup>-3</sup> resulted in convulsions, vomiting, and death in exposed squirrel monkeys, while dogs convulsed, vomited, and were unusually aggressive during continuous exposure to 200 mg m<sup>-3</sup>, but not during repeated exposures to 495 mg m<sup>-3</sup>. While deaths of two squirrel monkeys were seen at the 200 mg m<sup>-3</sup> exposure level (on days 3 and 4), both monkeys were heavily infested with parasites, potentially playing a role in their susceptibility to sulfolane toxicity. While none of the rodents convulsed at any of the subchronic exposures, histological investigations indicated leukopenia and increased plasma transaminase activity in guinea pigs exposed to 200 mg m<sup>-3</sup>, but not those exposed to 159 mg m<sup>-3</sup>.

None of the toxic effects observed at 200 mg m<sup>-3</sup> in any of the test species were found on exposure to concentrations of 20 mg m<sup>-3</sup> or lower. As such, the exposure concentration of 20 mg m<sup>-3</sup> could be considered the no-observable-adverse-effect-level (NOAEL).

**Zhu et al. (1987)**

A study of the chronic toxicity of sulfolane administered orally to guinea pigs (which had just stopped breast-feeding) at dose levels of 0.25, 2.5, 25, and 250 mg kg<sup>-1</sup> bw was reported by Zhu *et al.* (1987). Forty guinea pigs, with equal numbers of males and females, were exposed to sulfolane for six months in each of the dose groups, and one control group. Biochemical and pathological evaluations were conducted on a subset of each dose group following three

months of exposure, with minor effects observed in the 2.5, 25, and 250 mg kg<sup>-1</sup> bw dose groups. Pathological tissue inspection indicated the main pathological change involved shrinkage of white pulp in the spleen.

After six months of exposure, significant changes were observed in a number of liver biochemical indices for the 250 mg kg<sup>-1</sup> bw male guinea pig group, with some changes noted in the 25 mg kg<sup>-1</sup> bw group. Pathological examinations indicated a significant increase in fatty deposits in the liver tissue for the 2.5, 25, and 250 mg kg<sup>-1</sup> bw exposure groups. Shrinkage of spleen white pulp and decreasing cell counts in spinal marrow was also noted in these three dose groups. No biochemical or pathological changes were found in the 0.25 mg kg<sup>-1</sup> bw dosage group.

Based on these study results, the authors reported a chronic threshold and no-effect doses for sulfolane of 2.5 and 0.25 mg kg<sup>-1</sup> bw bodyweight, respectively, and a maximum allowable concentration (MAC) of 5 mg L<sup>-1</sup> in drinking water for humans (Zhu *et al.*, 1987).

#### ***Huntingdon Life Sciences (2001)***

The Huntingdon Life Sciences (HLS, 2001) study involved exposure of rats to sulfolane in their drinking water for 13 weeks at concentrations of 0, 25, 100, 400, and 1,600 mg L<sup>-1</sup>, which was calculated by HLS to be equivalent to the following levels:

Males: 2.1, 8.8, 35, and 131.7 mg kg<sup>-1</sup> bw day<sup>-1</sup>

Females: 2.9, 10.6, 42, and 191.1 mg kg<sup>-1</sup> bw day<sup>-1</sup>

The sulfolane exposure was reported to be well tolerated, with the only adverse effects being a nephropathy in male rats at the two highest doses, and reduced white blood cell (WBC) counts in females in the three highest dose groups. The nephropathy is typical of the well-known phenomenon specific to male rats that occurs following prolonged exposure to many hydrocarbons and derivatives, and is not considered to be of toxicological relevance to humans. The stated NOAEL for male rats in this study, with nephropathy as the endpoint, was 8.8 mg kg<sup>-1</sup> day (100 mg sulfolane L<sup>-1</sup> drinking water).

The WBC reductions are consistent with observations from the Andersen *et al.* (1977) inhalation study. In the latter investigation they occurred after a single, high concentration, 17.5 hour exposure, as well as after longer term exposures at the higher test concentrations in both sexes of rat (no data is given for female rats in the Andersen *et al.* (1977) paper, but male rats were definitely susceptible, whereas they were unaffected in the HLS (2001) study). WBC reductions were also observed in squirrel monkeys and guinea pigs exposed to high doses, but not in any of the four tested species after prolonged inhalation of 20 mg m<sup>-3</sup>. A WBC reduction after a single exposure, as occurred in the Andersen *et al.* (1977) study, indicates a direct toxic effect on the WBCs. No pathological lesions were found in the females. The NOAEL in female rats in the HLS (2001) study was 2.9 mg kg<sup>-1</sup> bw day<sup>-1</sup> (25 mg sulfolane L<sup>-1</sup> drinking water).

Sulfolane has not been studied for its acute or chronic effects on humans, however, there is definitely evidence that sulfolane has adverse effects on animals. While toxicology research conducted on animals is not conclusive for human health effects, animal toxicological studies have been shown to help predict human health impacts.<sup>iii</sup>

Sulfolane has

“exceptional chemical and thermal stability, and unusual solvent properties. Due to the low potential for sulfolane to absorb to sediments or soils and retardation coefficients in aquifer sediments that indicate sulfolane will migrate at a similar velocity to ground water flow, sulfolane is predicted to be highly mobile in the subsurface. Biodegradation under typical aquifer conditions may be insignificant; however, biodegradation rates may be increased by the addition of phosphorous and/or nitrogen to aerobic systems and previous exposure of the microbial degrader community to sulfolane.”<sup>iv</sup>

*Nature and history of any activities that have occurred regarding the release/threatened release:*

Beginning in 1977, Flint Hills Resources' North Pole Refinery has processed North Slope crude oil and supplies gasoline, jet fuel, heating oil, diesel, gasoil and asphalt to Alaska markets. The Alaska Department of Environmental Conservation (ADEC) has documented oil spills from refinery operations onto or within lands over the plant's history. Those spills have occurred from leaking storage tanks, leaking sumps, overflow of the wastewater handling pond and certain handling procedures.

In the late 70s and early 80s, very large but unknown amounts of petroleum product leaked from above-ground storage tanks. These tanks have since been taken out of service. In 1986, the US EPA issued two RCRA 3008 Administrative Orders on Consent to then-owner MAPCO, and ADEC issued a Compliance Order by Consent. These orders outlined a cleanup and monitoring strategy.

In 1987, monitoring well data indicated that groundwater at the refinery was contaminated with petroleum compounds, including benzene, toluene, ethylbenzene, xylenes, trimethylbenzenes, and naphthalene above ADEC's regulatory maximum contaminant levels for drinking water. The drinking water used at the refinery was tested and found to be unaffected, as was the city water system. The refinery connected to City water and began some treatment and monitoring of the groundwater and performed further site characterization.

In 1999, EPA determined that the facility had met some of the requirements of its compliance orders and deferred lead agency status to ADEC pending negotiation and implementation of these and other points:

1. Review site characterization to define the nature and extent of existing soil and groundwater contamination and any changes in hydrogeology.
2. Develop an interim and long-term corrective action plan, including establishing plume containment or control procedures for releases that may migrate offsite.

Site characterization activities during 2000-2002 identified an unknown chemical within groundwater monitoring wells. Further analysis identified it as sulfolane, and it was believed to be coming from past gasoline spills. Sulfolane, used in the refining process, was dissolved in gasoline but is also soluble in water, allowing it to dissolve in and be carried along in groundwater.

Sulfolane has been found in over 100 private wells in the North Pole area and in the North Pole City Water system. People can be exposed through several pathways, including: ingestion of drinking water, skin absorption from bathing/washing, and contamination of garden produce watered with sulfolane-contaminated water.


In addition to fuel spills, the Flint Hills Refinery has violated the Clean Air Act at least 10 times and was fined nearly \$16,000 by the EPA back in 2006.<sup>y</sup>

*State and local authorities you have contacted about the release/threatened release and the response, if any:*

Community residents who have met with state agency officials have been dissatisfied with the inadequate response and have continuing concerns about the threat of the groundwater contamination to public health. ADEC and the Alaska Department of Health and Social Services are aware of the situation but have not properly characterized the extent of the sulfolane contamination and have not mandated cleanup of the chemical spill. The state agencies have not taken proper actions to assess exposure pathways/health outcomes and ensure protection of environmental and human health.

This is a serious situation that affects the household water of hundreds of residents in the North Pole area. Please ensure that the refinery spills are properly characterized and decontaminated.

Sincerely,



Pamela K. Miller  
Executive Director



Sara Hannon  
Researcher

---

<sup>y</sup>Canadian Council of Ministers on the Environment. 2006. Canadian environmental quality guidelines for sulfolane: Soil and water. Available: [http://www.ccme.ca/assets/pdf/sulfolane\\_ssd\\_soil\\_water\\_1.1\\_e.pdf](http://www.ccme.ca/assets/pdf/sulfolane_ssd_soil_water_1.1_e.pdf) [Accessed 20 May 2010].

---

<sup>ii</sup> British Columbia Ministry of Water Land and Air Protection. 2001. Water Quality Guidelines for Sulfolane. Available: <http://www.llbc.leg.bc.ca/public/pubdocs/bcdocs/357409/sulfolanetech.pdf> [Accessed 20 May 2010].

<sup>iii</sup> National Research Council. 2004. Intentional human dosing studies for EPA regulatory purposes: Scientific and regulatory issues. Available: [http://books.nap.edu/catalog.php?record\\_id=10927](http://books.nap.edu/catalog.php?record_id=10927) [Accessed 20 May 2010].

<sup>iv</sup> Ambient water quality guidelines for sulfolane: overview report. Prepared by N.K. Nagpal, Ph.D. Water Protection Section: Water, Air and Climate Change Branch. Author: N.K. Nagpal. Cf. Colophon. ISBN 0-7726-5096-9

<sup>v</sup> US EPA. 2006. EPA fines Flint Hills Resources Alaska, LLC nearly \$16,000 for CAA violations. Available:

<http://yosemite.epa.gov/opa/admpress.nsf/b0789fb70f8ff03285257029006e3880/6b191200b3ce87e2852572430062f987!OpenDocument> [Accessed 20 May 2010].